

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: :
: Group Art Unit: 2611
Anthony Bessios et al. :
: Examiner: Leila Malek
Appln. No.: 10/667,492 :
: Confirmation No.: 1240
Filed: September 23, 2003 :
: Customer No.: 30813
For: TECHNIQUE FOR DETERMINING :
OPTIMAL TRANSITION-LIMITING :
CODE FOR USE IN A MULTI-LEVEL :
SIGNALING SYSTEM :

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed March 27, 2008, and in response to the Notice of Panel Decision from Pre-Appeal Brief Review dated July 7, 2008.

REAL PARTY IN INTEREST

The Appellants, Anthony Bessios and Jared Zerbe, are the Applicants in the above-identified patent application. The Appellants have assigned their entire interest in the above-identified patent application to Rambus Inc., 4440 El Camino Real, Los Altos, California 94022.

RELATED APPEALS AND INTERFERENCES

The Appellants, the Appellants' legal representative, and the Assignee are not aware of any other appeals or interferences which will directly affect, be directly affected by, or have a bearing on the Board's decision in this Appeal.

STATUS OF CLAIMS

Claims 1-9 and 11 are pending in the above-identified patent application. Claims 1-9 and 11 were finally rejected in an Office Action dated November 27, 2007. The final rejection of claims 1-9 and 11 is hereby appealed.

Claims 1-9 and 11 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement.

Claim 11 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Claim 11 also stands rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final rejection of claims 1-9 and 11 in the Office Action dated November 27, 2007.

SUMMARY OF CLAIMED SUBJECT MATTER

The claimed invention, as set forth in claim 1, and as described and shown in the specification and Figures 1-16 of the above-identified patent application, respectively, is directed to a method for determining an optimal transition-limiting code for use in a multi-level signaling system (e.g., see Figures 13-16; Abstract; paragraphs [0003], [0011], [0031]). The method may comprise determining a coding gain for each of a plurality of transition-limiting codes (e.g., see Figures 13-16; Abstract; paragraphs [0011], [0012], [0013], [0037], [0052], [0054], [0056], [0059]). The method may also comprise selecting one of the plurality of transition-limiting codes having a largest coding gain for use in the multi-level signaling system (e.g., see Figures 13-16; Abstract; paragraphs [0011], [0012], [0013], [0031], [0058], [0059]). The method may further comprise employing the selected transition-limiting code in the multi-level signaling system to at least reduce a number of full-swing transitions between sequential signals (e.g., see Figures 13-16;

Abstract; paragraphs [0003], [0011], [0012], [0013], [0014], [0031], [0059], [0060])).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-9 and 11 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement.

Claim 11 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Claim 11 also stands rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

ARGUMENT

The Appellants respectfully appeal the decision of the Examiner to finally reject claims 1-9 and 11 of the above-identified patent application. As discussed below, it is respectfully submitted that the Examiner is incorrect in asserting that claims 1-9 and 11 fail to comply with the enablement requirement, claim 11 fails to comply with the written description requirement, and claim 11 is directed to non-statutory subject matter.

I. THE EXAMINER IS INCORRECT IN ASSERTING THAT CLAIMS 1-9 AND
11 FAIL TO COMPLY WITH THE ENABLEMENT REQUIREMENT

The Examiner asserts that the claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. Specifically, the Examiner asserts that the specification fails to describe a "transition-limiting code."

Applicants respectfully disagree. Specifically, Applicants respectfully submit that the specification is replete with descriptions of transition-limiting codes. For example, the specification recites:

transition-limiting codes . . . reduce or eliminate the number of full-swing transitions (FST) between sequential symbols in a multi-level signaling system. Reducing or eliminating the number of FST between sequential symbols enhances system performance in terms of: 1.) voltage margins (Vm), by reducing peak distortion (PD) via the elimination of one or more worst case sequences; and 2.) timing margins (Tm), especially at outer eyes where FST close eyes the most.

(paragraph [0008]). The specification also recites:

transition-limiting codes . . . secure a minimum density of desirable symbol transitions useful for clock recovery. These clock data recovery (CDR) transitions prevent continuous phase drifting from an optimum sampling point at the center of an eye in plesiochronous systems with frequency

offsets between received data and a local receive clock.

(paragraph [0009])). The specification further recites:

[t]ransition-limiting codes . . . eliminate the number of full-swing transitions (FST) between sequential symbols in a multi-level signaling system. These transition-limiting codes . . . provide useful clock data recovery (CDR) transitions. Other transition-limiting codes . . . reduce the number of full-swing transitions (FST) between sequential symbols in a multi-level signaling system. These other transition-limiting codes . . . usually provide useful clock data recovery (CDR) transitions.

(paragraph [0031])). The specification still further recites:

[t]he use of transition-limiting codes has the direct and indirect effects of: 1.) reduction of maximum transition swing $\max|\Delta d_c| = 2/3 \cdot \max|\Delta d_v| = 4$; 2.) change of the line rate (lr), and therefore $h_i^c \neq h_i^u$; and 3.) further attenuation of the pulse response h_0 , which also represents channel attenuation.

(paragraph [0036])). The specification still further recites:

transition-limiting codes can increase the resilience of multi-level line codes to reflections. By reducing or eliminating full-swing transitions these transition-limiting codes can reduce peak and mean square distortion, and increase the timing margins.

(paragraph [0059])). Also, the two provisional applications (i.e., U.S. Provisional Patent Application Nos. 60/450,349 and 60/494,561) to which the present application claims priority, and the entirety of which are incorporated by reference in the present application, are equally replete with descriptions of transition-limiting codes. Thus, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

At this point Applicants would like to emphasize that the claims are directed to a method for determining an optimal transition-limiting code for use in a multi-level signaling system, and not creating and/or generating a transition-limiting code. That is, the claims are directed to a method for determining an optimal transition-limiting code out of a plurality of transition-limiting codes that have already been created and/or generated. As discussed above and below, Applicants respectfully submit that it is clear that persons of ordinary skill in the art are well aware of transition-limiting codes. However, as discussed above, the claims are directed to a method for determining an optimal transition-limiting code out of a plurality of transition-limiting codes that have already been created and/or generated for use in a multi-level signaling

system (i.e., not creating and/or generating a transition-limiting code). The specification fully supports this claimed methodology at, for example, paragraph [0011] to paragraph [0016]; and paragraph [0037] to paragraph [0059]. Thus, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

The Examiner also asserts that the Examiner searched other available references, but could not find a definition for transition-limiting code.

Applicants find this hard to believe. Specifically, Applicants respectfully submit that persons of ordinary skill in the art are well aware of the term transition-limiting code based upon numerous readily available publications that clearly describe transition-limiting codes. For example, the following papers and patent publications are readily available and clearly describe transition-limiting codes: U.S. Patent Nos. 5,859,601, 6,526,530, 6,819,137, 6,917,312, 7,113,550, 7,180,957, 7,180,958, 7,180,959, and 7,302,631; U.S. Patent Application Publication Nos. US2004/0109510A1, US2003/0152154A1, US2006/0126751A1, US2005/0099325A1, US2004/0240580A1, US2004/0208257A1, US2004/0170231A1, and US2004/0109509A1; International Patent Application Publication Nos. WO/1998/044633

and WO/2004/053810; A. Bessios et al., Transition-limiting codes for 4-PAM signaling in high speed serial links, Global Telecommunications Conference, 2003, GLOBECOM '03, IEEE, Volume 7, pages 3747-3751, December 1-5, 2003; and V. Stojanovic, Channel-Limited High Speed Links: Modeling, Analysis and Design, PhD Dissertation, Stanford University, September 2004. Regarding the above-referenced patent publications, some of which actually claim the creation of transition limiting codes, it almost incomprehensible that the Examiner is asserting that he was unable to find a definition for the term transition-limiting code. Thus, in view of the foregoing, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

Also, claim 1 recites specific steps for determining an optimal transition-limiting code for use in a multi-level signaling system (i.e., not creating and/or generating a transition-limiting code). The steps comprise determining a coding gain for each of a plurality of transition-limiting codes; selecting one of the plurality of transition-limiting codes having a largest coding gain for use in the multi-level signaling system; and employing the selected transition-limiting code in the multi-level signaling system to at least reduce a

number of full-swing transitions between sequential signals. Each of these steps is well supported in the specification and described in such a manner as to enable one skilled in the art to make and/or use the claimed invention (e.g., see paragraphs [0011]-[0014], [0037], [0052], [0054], [0056], [0058], and [0059] in U.S. Patent Application Publication No. US2004/0170231A1). The remaining claims are equally well supported in the specification. Thus, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

In view of the foregoing, it is respectfully requested that the aforementioned enablement rejection of claims 1-9 and 11 be withdrawn.

II. THE WRITTEN DESCRIPTION REJECTION OF CLAIM 11

The Examiner asserts that there is no support in the specification for "readable storage medium."

Applicants respectfully disagree. Specifically, the specification clearly recites that "it is within the scope of the present invention that such instructions may be stored on one or more processor readable carriers (e.g., a magnetic disk), or transmitted to one or more processors via one or more

signals" (see paragraph [0060]). Applicants respectfully submit that one skilled in the art would understand that a processor readable carrier in the form of, for example, a magnetic disk, would encompass a processor readable storage medium since such a processor readable carrier is a medium (e.g., a magnetic disk) that stores computer instructions. Applicants would also like to remind the Examiner (and the Board) that a patent applicant may be his/her own lexicographer.

At this point it should be noted that, as stated in MPEP § 2163.02, the fundamental factual inquiry is whether a claim defines an invention that is clearly conveyed to those skilled in the art at the time the application was filed. The subject matter of the claim need not be described literally (i.e., using the same terms or in haec verba) in order for the disclosure to satisfy the description requirement.

In view of the foregoing, it is respectfully requested that the aforementioned written description rejection of claim 11 be withdrawn.

III. THE NON-STATUTORY SUBJECT MATTER REJECTION OF CLAIM 11

The Examiner asserts that a storage medium is non-statutory subject matter.

Applicants respectfully disagree. Specifically, there is a long list of cases that clearly define a storage medium as being statutory subject matter. For example, Applicants direct the Examiner's (and the Board's) attention to the case law set forth in In re Beauregard, 53 F.3d 1583, (Fed. Cir. 1995), In re Lundgren, 76 USPQ2d 1385 (Bd. Pat. App. & Int. 2005), and others, which clearly provide a patentable subject matter basis for a storage medium.

In view of the foregoing, it is respectfully requested that the aforementioned non-statutory subject matter rejection of claim 11 be withdrawn.

CONCLUSION

In view of the foregoing, it is respectfully submitted that the Examiner is incorrect in asserting that claims 1-9 and 11 fail to comply with the enablement requirement, claim 11 fails to comply with the written description requirement, and claim 11 is directed to non-statutory subject matter. Thus, it is respectfully submitted that the final rejection of claims 1-9 and 11 is improper and the reversal of same is clearly in order and respectfully requested.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made.

U.S. Patent Application No.: 10/667,492
Attorney Docket No.: 57941.000023
Client Reference No.: RA297.P.US

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 50-0206, and please credit any excess fees to such deposit account.

Respectfully submitted,

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CLAIMS APPENDIX

1 (Previously Presented). A method for determining an optimal transition-limiting code for use in a multi-level signaling system, the method comprising the steps of:

determining a coding gain for each of a plurality of transition-limiting codes;

selecting one of the plurality of transition-limiting codes having a largest coding gain for use in the multi-level signaling system; and

employing the selected transition-limiting code in the multi-level signaling system to at least reduce a number of full-swing transitions between sequential signals.

2 (Original). The method of claim 1, wherein the plurality of transition-limiting codes reduce or eliminate full-swing transitions between signal levels in the multi-level signaling system.

3 (Original). The method of claim 2, wherein at least some of the plurality of transition-limiting codes have different degrees of reduction or elimination of full-swing transitions between signal levels in the multi-level signaling system.

4 (Original). The method of claim 3, wherein the step of determining a coding gain for each of a plurality of transition-limiting codes comprises the steps of:

a.) selecting a first transition-limiting code having a first degree of reduction or elimination of full-swing transitions;

b.) determining the coding gain of a data transmission over a channel operating at a predetermined data rate in the multi-level signaling system utilizing the first transition-limiting code based at least in part upon the first degree of reduction or elimination of full-swing transitions; and

c.) repeating steps a and b utilizing a second transition-limiting code having a second degree of reduction or elimination of full-swing transitions.

5 (Original). The method of claim 3, wherein the step of determining a coding gain for each of a plurality of transition-limiting codes comprises the steps of:

a.) characterizing a first pulse response for a channel operating at a predetermined data rate in the multi-level signaling system utilizing a first transition-limiting code having a first degree of reduction or elimination of full-swing transitions;

b.) determining the coding gain of a data transmission over the channel using the first transition-limiting code based at least in part upon the first degree of reduction or elimination of full-swing transitions; and

c.) repeating steps a and b utilizing a second transition-limiting code having a second degree of reduction or elimination of full-swing transitions.

6 (Original). The method of claim 1, wherein at least some of the plurality of transition-limiting codes have different sampling rates.

7 (Original). The method of claim 6, wherein the step of determining a coding gain for each of a plurality of transition-limiting codes comprises the steps of:

a.) selecting a first transition-limiting code having a first sampling rate;

b.) determining the coding gain of a data transmission over a channel operating at a predetermined data rate in the multi-level signaling system utilizing the first transition-limiting code based at least in part upon the first sampling rate; and

c.) repeating steps a and b utilizing a second transition-limiting code having a second sampling rate.

8 (Original). The method of claim 6, wherein the step of determining a coding gain for each of a plurality of transition-limiting codes comprises the steps of:

a.) characterizing a first pulse response for a channel operating at a predetermined data rate in the multi-level signaling system utilizing a first transition-limiting code having a first sampling rate;

b.) determining the coding gain of a data transmission over the channel using the first transition-limiting code based at least in part upon the first pulse response; and

c.) repeating steps a and b utilizing a second transition-limiting code having a second sampling rate.

9 (Original). The method of claim 1, wherein the coding gain for each of a plurality of transition-limiting codes comprises:

a first component based upon a sampling rate of a pulse response for a channel operating at a predetermined data rate in the multi-level signaling system utilizing the transition-limiting code; and

a second component based upon a degree of reduction or elimination of full-swing transitions between signal levels in the multi-level signaling system utilizing the transition-

limiting code.

10 (Cancelled).

11 (Previously Presented). At least one processor readable storage medium for storing a computer program of instructions configured to be readable by at least one processor for instructing the at least one processor to execute a computer process for performing the method as recited in claim 1.

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EVIDENCE APPENDIX

[NONE]

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RELATED PLEADINGS APPENDIX

[NONE]